

(p) Mixing of incompatible vapors is prohibited. The VCS piping, equipment, hoses, valves, and arresters must be purged between vapor control operations that involve incompatible chemical vapors in accordance with the following:

(1) Chemical compatibility must be determined by using the procedures contained in 46 CFR part 150;

(2) Purge gas must be an inert gas, air, or enriching gas, and must be adequate to reduce the level of residual vapor to a level at which reaction with the subsequent vapor cannot occur; and

(3) The required duration of purge time must be calculated and approved by the certifying entity during the certification or recertification.

(q) After each transfer operation, the VCS piping, equipment, hoses, valves, and arresters must be purged with at least two-system volume exchanges of non-reactive gas or air so the VCS is left with a safe condition.

(r) VCS equipment and instrumentation must be tested in compliance with 33 CFR 156.170(g) or (i), with the COTP or designated representative invited to observe these tests. The test procedure and a checklist must be approved by the certifying entity during the initial certification of the system and incorporated into the facility operations manual.

(s) A transfer operation that includes collection of vapor emitted to or from a vessel's cargo tanks must meet the transfer requirements of 33 CFR 156.120(aa), and a declaration of inspection meeting the requirements of 33 CFR 156.150 must be completed before each transfer.

ALTERNATIVE ANALYZER AND PRESSURE SENSOR RELIABILITY TESTING

§ 154.2180 Alternative testing program—Generally.

(a) As an alternative to complying with the vapor control system (VCS) analyzer and pressure sensor safety testing requirements provided by 33 CFR 154.2150(c) and 33 CFR 154.2250(c), the facility person in charge may administer a reliability assurance test program in accordance with this section and 33 CFR 154.2181.

(b) As used in this section—

(1) *Calibration drift* or *CD* means the difference in the analyzer output readings from the established reference value after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place;

(2) *Calibration error* or *CE* means the difference between the gas concentration exhibited by the gas analyzer and the known concentration of the cylinder gas;

(3) *Response time* or *RT* means the time interval between the start of a step change in the system input (e.g., change of calibration gas) and the time when the data recording system displays 95 percent of the final stable value; and

(4) *Sampling system bias* or *SSB* means the difference between the gas concentrations indicated by the measurement system when a known cylinder gas is introduced at or near the sampling probe and when the same gas is introduced directly to the analyzer.

(c) All analyzers used in a VCS must be tested for safety system functions, CE, CD, RT, and SSB, in accordance with 33 CFR 154.2181.

(d) All pressure sensors/switches used in a VCS must be tested for safety system functions, CE and CD, in accordance with 33 CFR 154.2181.

(e) The facility person in charge must ensure the following:

(1) Calibration of instrumentation using standard procedures provided by the manufacturer or service provider;

(2) Monitoring of all interlocks, alarms, and recording devices for proper operation while instrumentation is being calibrated;

(3) Use of a certified gas standard that is within plus or minus two (2) percent of its certified concentration to calibrate the analyzers; and

(4) Use of a certified secondary standard that is standardized against a primary standard to calibrate the pressure sensors/switches.

(f) Upon failing any test under 33 CFR 154.2181, the facility person in charge must ensure that all monthly and quarterly tests, including CE, CD, RT, and SSB, are conducted; and until all quarterly tests are completed, the person in charge must ensure that the vapor control alarms and automatic

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shutdown system are tested no more than 24 hours prior to any transfer or tank barge cleaning operation.

(g) Analyzers required by 33 CFR 154.2105(a) and (j) and 154.2107(d) and (e) must be checked for calibration using a zero gas and a span gas.

(h) The facility operator must maintain and make available upon the request of the Commandant and the certifying entity that certifies the VCS the following reliability assurance test program documents for two years:

- (1) All test procedures;
- (2) The dates of all tests, type of tests made, and who conducted the tests;
- (3) Results of the tests, including the “as found” and “as left” conditions; and
- (4) A record of the date and time of repairs made.

§ 154.2181 Alternative testing program—Test requirements.

(a) The safety system function test required by 33 CFR 154.2180 must be performed once every two weeks and test for the proper operation and interaction of the analyzer or pressure sensor/switch with shutdown interlocks, and audible and visible alarm devices.

(b) The calibration error (CE) test required by 33 CFR 154.2180 must be per-

formed once every month and documented as shown in Forms 154.2181(b)(2) and 154.2181(b)(3) of this section, to document the accuracy and linearity of the monitoring equipment for the entire measurement range.

(1) The CE test must expose the measurement system, including all monitoring components (e.g., sample lines, filters, scrubbers, conditioners, and as much of the probe as practicable), to the calibration gases, introduced through an injection port located so as to allow a check of the entire measurement system when calibration gases are introduced;

(2) The CE test must check the calibrated range of each analyzer using a lower (zero) and upper (span) reference gas standard. Three measurements must be taken against each standard and recorded as shown in Form 154.2181(b)(2) of this section, with the average of the three values in each case then used to calculate the CE according to this equation (where CE = percentage calibration error based upon span of the instrument, R = reference value of zero or high-level calibration gas introduced into the monitoring system, A = actual monitoring system response to the calibration gas, and S = span of the instrument):

$$CE = \frac{|R - A|}{S} \times 100$$

Form 154.2181(b)(2): Calibration error determination.

	Calibration value	Monitor response	Difference	
			Zero	Span
1-Zero				
1-Span				
2-Zero				
2-Span				
3-Zero				
3-Span				
Mean Difference =				
Calibration Error =			%	%